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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/541,654	07/07/2005	Joachim Kupe	DP-309749	3500

7590 10/06/2010

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EXAMINER	
NGUYEN, TU MINH	

ART UNIT	PAPER NUMBER
3748	

MAIL DATE	DELIVERY MODE
10/06/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/541,654	KUPE ET AL.	
	Examiner	Art Unit	
	TU M. NGUYEN	3748	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 September 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,17,24,34,37 and 49-62* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,17,24,34,37 and 49-62* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 July 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. An Applicant's Request for Continued Examination (RCE) filed on September 9, 2010 has been entered. Per instruction from the RCE, an enclosed Applicant's Amendment has been entered. Claims 3-16, 18-23, 25-33, 35, 36, and 38-48 have been canceled; claims 1, 17, 24, 34, and 37 have been amended; and claims 49-62 have been added. Overall, claims 1, 17, 24, 34, 37, and 49-62 are pending in this application.

Claim Objections

2. Claim 17 is objected to because on line 2 of the claim, "the reformer" should read --a reformer--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office Action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 34 and 62 are rejected under 35 U.S.C. 102(e) as being anticipated by Duvinage et al. (PTC Publication WO 02/100519) (see U.S. Patent 7,254,939) for the English equivalence).

Re claim 34, as shown in Figures 2 and 4, Duvinage et al. disclose a NOx abatement system, comprising:

- an in-line selective catalytic reduction (SCR) catalyst (4) adapted for storing ammonia and being disposed in fluid communication with an engine (1);

- an off-line reformer (14) adapted for producing a reformate comprising primarily hydrogen and carbon monoxide, the reformer being in fluid communication with the SCR catalyst;

- an off-line reactor (17) including an ammonia forming catalyst being in fluid communication with and downstream of the reformer (14); and

- an off-line burner (16) in fluid communication with and upstream of the reformer (14) and the reactor (17).

Re claim 62, the system of Duvinage et al. further includes an off-line mixing chamber (18) disposed upstream of the reactor (17), downstream of and in fluid communication with the reformer (14), and in direct fluid communication with the burner (17).

5. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Kinugasa et al. (U.S. Patent 6,109,024).

As shown in Figure 1, Kinugasa et al. disclose a NOx abatement system comprising:

- a NOx adsorber (7) disposed in-line downstream of and in fluid communication with an engine (1); and

- a selective catalytic reduction (SCR) catalyst (9) adapted for storing ammonia and being disposed in-line, directly downstream of and in direct fluid communication with the NOx adsorber (7).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office Action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 17, 49, and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinugasa et al. as applied to claim 1 above, in view of Duvinage et al.

Re claim 17, Kinugasa et al. disclose the invention as cited above, however, fail to disclose that for a diesel engine that is typically run lean, the ammonia is generated off-line by a burner, reformer, and a reactor.

As shown in Figure 1, Duvinage et al. disclose an exhaust gas purification unit with reducing agent supply, having a SCR catalyst (4) and an off-line ammonia injection (10) at a location upstream of the SCR catalyst. As depicted in Figure 4, Duvinage et al. teach that it is conventional in the art to generate the off-line ammonia by burning (in burner unit (16)) fuel off-line to form burner NOx; forming a reformate that includes primarily hydrogen and carbon monoxide in a reformer (14); and reacting the burner NOx with the reformate in a reactor (17) to form off-line ammonia. It would have been obvious to one having ordinary skill in the art at the

time of the invention was made, to have utilized the off-line ammonia generation taught by Duvinage et al. in the system of Kinugasa et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to effectively generate off-line ammonia for use with a diesel engine.

Re claim 49, as taught by Duvinage et al., the modified system of Kinugasa et al. further includes an off-line reformer ((14) in Duvinage et al.) adapted to produce a reformate having primarily hydrogen and carbon monoxide and disposed in selective communication with, and upstream from the NOx adsorber (7) and the SCR catalyst (9).

Re claim 54, as depicted in Figure 4 by Duvinage et al., the modified system of Kinugasa et al. further includes an off-line burner (16) disposed upstream of and in fluid communication with the reformer (14); and an off-line reactor (17) including an ammonia forming catalyst being in fluid communication with and disposed downstream of the reformer.

8. Claims 50-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinugasa et al. as applied to claim 1 above, in view of Kupe et al. (U.S. Patent 6,832,473).

Kinugasa et al. disclose the invention as cited above, however, fail to disclose that the system further comprises a first oxidation catalyst and a particulate filter disposed in-line, upstream of and in fluid communication with the NOx adsorber.

As shown in Figure 2, Kupe et al. disclose a system for regenerating NOx adsorbers and particulate filters, comprising a NOx trap (32) and an off-line fuel reformer (16) to provide a reformate to the NOx trap. Kupe et al. teach that it is conventional in the art to include an oxidation catalyst (34) and a particulate filter (36) disposed in-line, upstream of and in fluid communication with the NOx trap to remove harmful soot emissions in an exhaust gas stream,

wherein the particulate filter includes a gas permeable ceramic material having a honeycomb structure. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the oxidation catalyst and the particulate filter taught by Kupe et al. in the system of Kinugasa et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to effectively remove harmful soot emissions in the exhaust gas stream.

9. Claims 52-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinugasa et al. as applied to claim 1 above, in view of Stroia et al. (U.S. Patent 6,820,414).

Kinugasa et al. disclose the invention as cited above, however, fail to disclose that the system further comprises an oxidation catalyst arranged on the downstream side of the SCR catalyst.

As shown in Figure 1, Stroia et al. disclose an after-treatment system having a soot filter (18) and a dual NOx adsorbers (26, 28) arranged in parallel. As indicated on lines 9-17 of column 5, Stroia et al. teach that it is conventional in the art to utilize an oxidation catalyst (40) arranged on the downstream side of the soot filter and the NOx adsorbers in order to remove unburned reducing agent that slips through the NOx adsorbers. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the oxidation catalyst taught by Stroia et al. in the system of Kinugasa et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to prevent inadvertent release of harmful reducing agent emissions into the atmosphere.

10. Claims 55-57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinugasa et al. as applied to claim 1 above.

Kinugasa et al. disclose the invention as cited above, however, fail to disclose that the system includes a plurality of NOx adsorbers being disposed in a parallel arrangement to an exhaust flow direction, the plurality of NOx adsorbers being disposed in-line, directly upstream of, and in direct fluid communication with a single SCR catalyst or with a respective plurality of SCR catalysts.

Kinugasa et al. disclose the claimed invention except for applying the invention to a system having a plurality of NOx adsorbers. It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the invention of Kinugasa et al. to an engine system having a plurality of NOx adsorbers in direct fluid communication with a single SCR catalyst or with a respective plurality of SCR catalysts, since the recitation of such amounts to an intended use statement. Note that both "engine with single NOx adsorber" and "engine with a plurality of NOx adsorbers" generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, etc, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification system of Kinugasa et al. for use in an engine system having a plurality of NOx adsorbers would be well within the level of ordinary skill in the art.

11. Claims 24 and 58-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gandhi et al. (U.S. Patent 7,332,135) in view of Duvinage et al.

Re claim 24, as shown in Figure 2, Gandhi et al. disclose a method of NOx abatement, comprising:

- storing engine NOx from an exhaust stream in a NOx adsorber (lean NOx adsorber) during a storage phase;

- forming reformate in-line including primarily hydrogen and CO at a cylinder of an internal combustion engine during a regeneration phase (rich pulses);

- reacting the reformate with the stored NOx at the NOx adsorber to produce ammonia during the regeneration phase;

- storing the ammonia in a selective catalytic reduction catalyst (NH3-SCR) during the regeneration phase, wherein the SCR catalyst being disposed in-line directly downstream of, and in direct fluid communication with the NOx adsorber.

Gandhi et al., however, fail to disclose that for a diesel engine that is typically run lean, the reformate is generated off-line by a reformer.

As shown in Figure 2, Duvinage et al. disclose an exhaust gas purification unit with reducing agent supply, having a NOx adsorber (5) and a SCR catalyst (4). As depicted in Figure 4, Duvinage et al. teach that it is conventional in the art to generate an off-line reformate (91) enriched with hydrogen and CO at a reformer (14), wherein the reformate is injected (9) into an exhaust stream for reaction at the NOx adsorber. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the reformer taught by Duvinage et al. in the method of Gandhi et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to effectively generate off-line reformate for use with a diesel engine.

Re claim 58, Gandhi et al. disclose the invention as cited above, however, fail to disclose that reacting the reformate with the stored NOx to produce greater than or equal to about 5,000 ppm ammonia during the regeneration phase.

With regard to applicants claim directed to a specified amount of ammonia during the regeneration phase, the specification of such would have been an obvious matter of design choice well within the level of ordinary skill in the art depending on design variables, such as the a required amount of NOx, type and size of SCR catalyst, operating temperature, etc. Moreover, there is nothing in the record which establishes that the specification of such presents a novel of unexpected result (See *In re Kuhle*, 526 F.2d 553, 188 USPQ 7 (CCPA 1975)).

Re claims 59-61, Gandhi et al. disclose the invention as cited above, however, fail to disclose that a plurality of NOx adsorbers is disposed in a parallel arrangement to an exhaust flow direction, wherein the plurality of NOx adsorbers being disposed in-line, directly upstream of, and in direct fluid communication with a single SCR catalyst or with a respective plurality of SCR catalysts.

Gandhi et al. disclose the claimed invention except for applying the invention to a system having a plurality of NOx adsorbers. It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply the invention of Gandhi et al. to an engine system having a plurality of NOx adsorbers in direct fluid communication with a single SCR catalyst or with a respective plurality of SCR catalysts, since the recitation of such amounts to an intended use statement. Note that both "engine with single NOx adsorber" and "engine with a plurality of NOx adsorbers" generate exhaust gases containing harmful emissions of HC, NOx, soot, CO, etc, that require purification before the gases can be released to the atmosphere; and the mere selection of the purification system of Gandhi et al. for use in an engine system having a plurality of NOx adsorbers would be well within the level of ordinary skill in the art.

12. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hammerle et al. (U.S. Patent 6,823,663) in view of Duvinage et al.

As shown in Figure 2A, Hammerle et al. disclose a method of NOx abatement comprising:

- introducing an off-line ammonia (via Urea Injection) into an exhaust stream;

- storing the ammonia in an in-line selective catalytic reduction (SCR) catalyst (14);

- introducing engine NOx to the SCR catalyst (14); and

- reacting the engine NOx with the ammonia.

Hammerle et al., however, fail to disclose that the off-line ammonia is generated by a reformer and a reactor.

As shown in Figure 1, Duvinage et al. disclose an exhaust gas purification unit with reducing agent supply, having a SCR catalyst (4) and an off-line ammonia injection (10) at a location upstream of the SCR catalyst. As depicted in Figure 4, Duvinage et al. teach that it is conventional in the art to generate the off-line ammonia by burning (in unit (16)) fuel off-line to form burner NOx, wherein an off-line burner (16) is upstream of and in fluid communication with a reformer (14) and a reactor (17); forming a reformate that includes primarily hydrogen and carbon monoxide in the reformer (14); and reacting the burner NOx with the reformate in the reactor (17) to form off-line ammonia. It would have been obvious to one having ordinary skill in the art at the time of the invention was made, to have utilized the off-line ammonia generation taught by Duvinage et al. in the method of Hammerle et al., since the use thereof would have been routinely practiced by those with ordinary skill in the art to effectively generate off-line ammonia for use at all operating conditions of an engine.

Prior Art

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure and consists of one patent: Jarvis et al. (U.S. Patent 6,182,443) further disclose a state of the art.

Communication

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571) 272-4862.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Thomas E. Denion, can be reached on (571) 272-4859. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Tu M. Nguyen/
Tu M. Nguyen
Primary Examiner
Art Unit 3748

TMN
September 30, 2010